

NOTES OF AMERICAN ARADINAE (HEMIPTERA: ARADIDAE)

NICHOLAS A. KORMILEV

Research Associate in Entomology, Bernice P. Bishop Museum, Honolulu, Hawaii 96818; mailing address: 8405 89th Street, Woodhaven, New York 11421.

Abstract.—Five new taxa are proposed: *Aradiolus chemsaki*, n.sp. (Mexico); *Aradus granuliger*, n.sp. (Mexico); *A. testaceus*, n.sp. (Mexico); *A. brevicornis*, n.sp. (California); and *A. occidentalis*, n.sp. (Washington). The female of *Aradiolus paradoxus* Kormilev is described, and the position of the genus *Aradiolus* Kormilev is discussed.

By the kind offices of Dr. John A. Chemsak, University of California, Berkeley, I had the privilege of studying the Aradidae under his care, for which I express my sincere gratitude.

Until a few years ago, the subfamily Aradinae had a single, worldwide genus, *Aradus* Fabricius, with about 200 species. Most of these species are distributed in the temperate and colder areas of the Palaearctic and Nearctic Regions. In the tropical and subtropical areas of the Neotropical, Oriental, Australian, and Ethiopian Regions the number of species is greatly reduced, and, with exception of a few species, they are represented only by the "lugubris group" which are very good flyers.

Some species of *Aradus* show more or less developed brachypterism and some stenopterism, but real apterous species are not known.

In 1967 I had the privilege of studying aradid collections at the Los Angeles County Museum of Natural History. Among other specimens of aradids, I found a fully developed male of an apterous species which had all characteristics of an *Aradus*, but the wings. Besides, this specimen had curious projections on the lateral sides of pro-, meso-, and metanotum, similar to those of the genus *Tretocoris* Usinger and Matsuda, (Chinamyersinae). As the characters of *Aradus* prevailed, I put it into the Aradinae, and named it *Aradiolus* Kormilev.

All measurements in this paper were taken with micromillimeter eyepiece. 25 units = 1 mm. In ratios, the first figure represents the length and the second the width of measured portion.

Genus *Aradiolus* Kormilev

Aradiolus Kormilev, 1967: 2.

This genus was established for a single male from Mexico, Oaxaca. It has a curious mixture of characters from two different subfamilies, Aradinae and Chinamyersinae. The ventral side of the body and genital segments are similar to *Aradus*, but the head, though of general *Aradus* shape, has distinct preocular tubercles as in *Tretocoris* Usinger and Matsuda, and the pro-, meso-, and metanotum are of the *Tretocoris* type. The labium is placed into a labial groove as in *Aradus*, and the metathoracic scent gland openings are not visible, probably concealed in the sockets of the hind coxae. The trochanters are fused with the femora as in *Aradus*, and the male genitalia are open from above as in *Aradus*.

Taking into consideration all these characters, I put this genus into the Aradinae.

Aradiolus paradoxus Kormilev

Fig. 1

Aradiolus paradoxus Kormilev, 1967: 4.

Female.—Ovate, much larger than male and more rounded laterally. Tergum VIII subtrapezoidal, with round hole in middle; genital lobes short and not contiguous.

Measurements: Head 48:43, relative length of antennal segments I to IV are: 11:39:24:10; pronotum 15:67; mesonotum width 90; metanotum width 100; abdomen 158:135 across segment IV; width of tergum VIII 52. Total length, 10.12 mm; width of pronotum 2.68 mm; width of abdomen 5.40 mm.

Color: Red-brown, partially infuscate.

Allotype ♀, Mexico, Oaxaca, La Ventana, 8 mi N; 20.VII.1963; J. Doyen leg; deposited at UCB-AES. Two ♂ and 6 nymphs, same locality and date. At the same collection and collection of the author.

Aradiolus chemsaki Kormilev, NEW SPECIES

Figs. 2-3

Male.—Elongate ovate; anterior process of head and antennal segments II and III covered with short, encrusted hairs, much shorter than in *A. paradoxus* Kormilev.

Head: Shorter than its width across eyes (37:55); anterior process rounded anteriorly, reaching basal $\frac{1}{4}$ of antennal segment II; antenniferous tubercles acute, slightly diverging; eyes globose and slightly pedunculate, placed near hind border of head; between eyes and antenniferous tubercles are placed 2 (1 + 1) strong, acute teeth; vertex with V-shaped rows of granules, depressed laterad of them. Antennae 1.63× as long as width of head across eyes; antennal segment I tapering toward base; II cylindrical, but

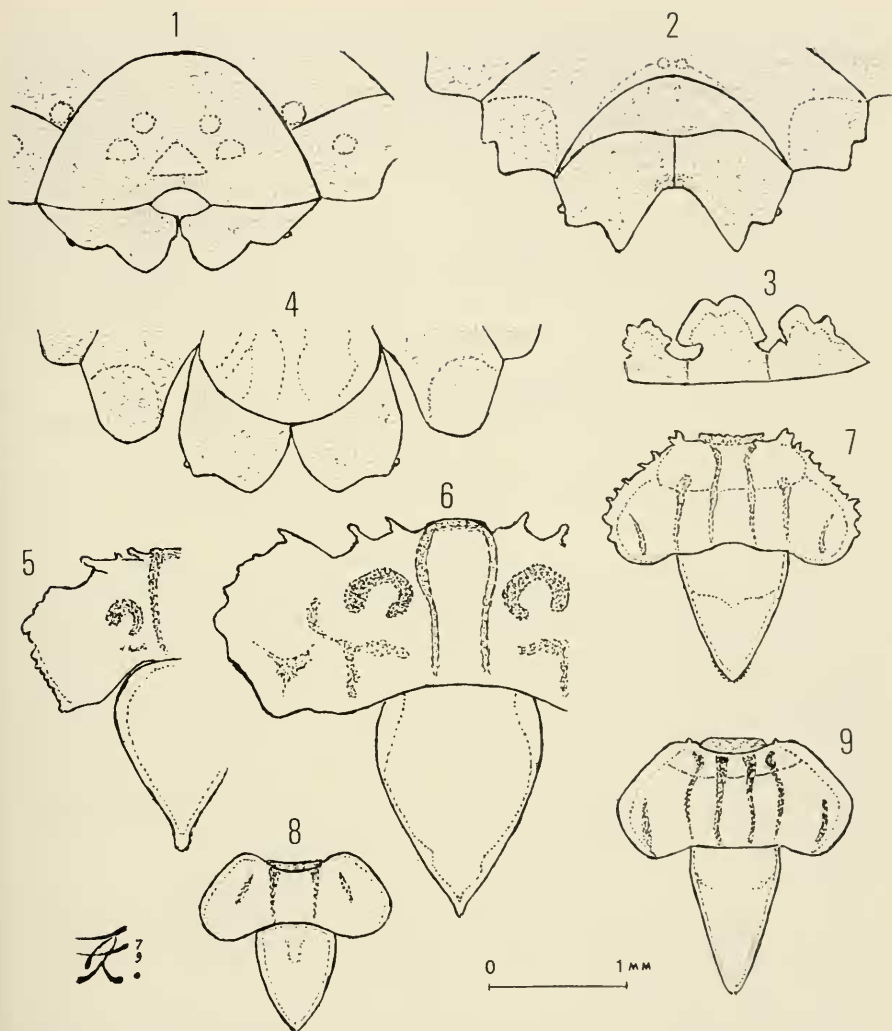


Fig. 1, *Aradiolus paradoxus*. Figs. 2-3, *A. cheusaki*. Figs. 4-6, *Aradus granuliger*. Fig. 7, *A. testaceus*. Fig. 8, *A. brevicornis*. Fig. 9, *A. occidentalis*. 1-2, Tip of female abdomen from above. 3, Left exterior border of female pro-, meso-, and metanotum. 4, Tip of male abdomen from above. 5, Left half of male pronotum and scutellum. 6, Left half of female pronotum and scutellum. 7-9, Pronotum and scutellum of males.

encrusted hairs make it look fusiform; III cylindrical; IV obovate; relative lengths of antennal segments I to IV are: 9:22:17:9. Labium arising from open labial atrium, produced beyond front border of mesosternum; labial groove distinct, open posteriorly.

Pronotum: Short and wide (11:45); collar thin, fused with disc; anterolateral borders finely denticulate, then with 2 bigger blunt teeth, strongly diverging; posterolateral borders slightly sinuate, then convex; hind border slightly convex; disc with V-shaped semiobliterated ridges, flanked by 2 (1 + 1) triangular, calloused spots, and further laterad by 2 (1 + 1) semiobliterated ridges. Pronotum separated from mesonotum by a deep transverse sulcus.

Mesonotum: Short and wide (6:53); middle of mesonotum occupied by cordate median plate, depressed medially. Lateral borders produced into 2 (1 + 1) triangular processes, incised on top. Hind border produced backward medially and separated from metanotum by sulcus.

Metanotum: Short and wide (4:57), semifused with tergum I posteriorly; lateral borders with similar triangular processes, but slightly larger.

Abdomen: Ovate, longer than its maximum width across segment IV (85:75). Tergum I narrower than tergum II and semifused with the latter, which is placed on lower level. Central dorsal plate consisting of terga III to VI, completely fused medially, but separated laterally. Disc is raised medially; median ridge is higher on terga III and VI; laterad of median ridge with 4 (2 + 2) rows of large, round, calloused spots and further laterad with 2 (1 + 1) rows of smaller, round spots. Central dorsal plate fused with connexivum laterally, the latter placed at a lower level. Front border of central dorsal plate straight and hind border roundly cut out medially in both sexes. Lateral borders of connexiva II to IV granulate, denticulate on V to VII. Tergum VII with arcuate front border and deeply sinuate hind border. Hypopygium open from above like in *Aradus*; genital lobes large, flat, contiguous at their front borders and with a tooth in middle of posterolateral border. Spiracles II to VII ventral, placed far from margin and nearer to front border, lateral and visible from above on genital lobes.

Legs: Trochanters fused with femora; the latter fusiform, with dense setigerous granulation; setae very short. Tibiae cylindrical; fore tibiae with a small comb, flanked by 2 (1 + 1) stiff setae, subapically. Tarsi bisegmented, without arolia.

Female.—Similar to male, but larger and more ovate. Genital segment similar to *Aradus* and pushed to ventral side, covered from above by tergum VIII and lobes. Tergum VIII flat, convex anteriorly and truncate posteriorly; lobes large, contiguous anteriorly and gaping posteriorly; their exterior borders cut out, forming teeth.

Color: Dark brown.

Measurements: Head 40:37; relative length of antennal segments I to IV are: 10:25:18:10.5; pronotum 12:51; mesonotum 15:65; metanotum 6:67; abdomen 110:100; width of tergum VIII across lobes 42. Total length: ♂—6.00, ♀—7.60 mm; width of pronotum: ♂—1.80, ♀—2.04 mm; width of abdomen: ♂—3.00, ♀—4.00 mm.

Types.—Holotype, ♂, Mexico, San Cristobal, 35 mi E of Chiapas: 26.VII.1957; J. A. Chemsak and B. J. Rannels leg.; deposited at UCB-AES. Allotype, ♀, same locality and collectors, 23.VII.1957; same collection.

Remarks.—It is a pleasure to dedicate this curious species to Dr. John A. Chemsak who collected it.

Aradiolus chemsaki is much smaller than *A. paradoxus*, the encrusted bristles on antennal segments II and III are shorter; and the triangular processes on the lateral borders of the pro-, meso-, and metanotum are smaller and incised apically. Genital segments in males are similar, but in the females different (see drawings).

Genus *Aradus* Fabricius

Aradus Fabricius, 1803: 116.

Aradus granuliger Kormilev, NEW SPECIES

Figs. 4–6

Male.—Elongate subtriangular; head, pronotum, corium, tergum, sternum, and venter densely covered with scalelike granulation. Stenopterous.

Head: Longer than its width across eyes (45:37). Anterior process long, with parallel sides, covered with dense, erect, encrusted bristles, reaching basal $\frac{1}{4}$ of antennal segment II; antenniferous tubercles acute, reaching $\frac{3}{4}$ of antennal segment I, their lateral teeth distinct; preocular teeth also distinct, acute; postocular teeth long, subacute and diverging. Eyes reniform and slightly pedunculate. Vertex with a deep, semicircular depression. Antennae thicker than fore femora (7:5); antennal segment I cylindrical, rounded at base; II slightly tapering toward base; III cylindrical; IV fusiform; relative length of antennal segments I to IV are: 10:35:25:13. Labium reaching apical $\frac{1}{4}$ of mesosternum.

Pronotum: Much shorter than wide (20:61); anterior angles cylindrical, directed sideways; lateral borders semicircular, crenulate. Carinae partially concealed by dense granulation; inner carinae parallel, not reaching hind border of disc, flanked by 2 (1 + 1) curved, black callosities; other carinae semiobliterated.

Scutellum: Subpentagonal, longer than its basal width (32:25), flattened on disc and raised at lateral borders.

Hemelytra: Stenopterous, reaching genital lobes; corium expanded and rounded at base, then much narrowed, reaching $\frac{1}{2}$ of connexivum IV. Membrane narrow at base, enlarged and rounded apically; veins of membrane parallel.

Abdomen: Subtrapezoidal, longer than its maximum width across segment V (100:96). Lateral borders diverging from II to V, forming right angle at VI and rounded at VII; posteroexterior angles progressively protruding,

rounded at V to VII. Genital lobes large, cut out apically, contiguous anteriorly, then diverging.

Female.—Ovate, much larger than male. Hemelytra with abbreviated membrane, reaching $\frac{1}{2}$ of tergum VI. Lateral borders of pronotum with 1 tooth anteriorly and with 5 progressively diminishing teeth laterally. Discs of connexiva more depressed than in male; exterior borders of connexiva straight from II to V, slightly sinuate on VI and VII. Tergum VIII subtriangular, disc depressed, genital lobes small, subtriangular, cut out posterolaterally, separated from each other.

Color: Brown to red-brown, but granulation is ocher; femora subapically and tibiae with base and two rings pale. Tergum of ♀ reddish medially.

Measurements: Head 50:43; relative length of antennal segments I to II (III and IV are missing) are: 12:38:—:—; pronotum 32:90; scutellum 42:30; abdomen 148:135. *Total length:* ♂—7.88, ♀—10.20 mm; width of pronotum: ♂—2.44, ♀—3.60 mm; width of abdomen: ♂—3.84, ♀—5.40 mm.

Types.—Holotype, ♂, Mexico, 20 mi N of El Lemon, 10.XI.1946; E. C. Van Dyke leg.; deposited at UCB-AES. Allotype, ♀, Mexico, Tomazunchale, 6.I.1941; G. E. Bohart leg.; same collection.

Remarks.—*Aradus granuliger* runs in Parshley's key to North American *Aradus* species (1921: 23) to *A. fuscomaculatus* Stål but is larger, the antenniferous tubercles have distinct lateral teeth, the postocular area is dentiform, antennal segment II is much longer than the distance between the eyes (35:25), and the labium is shorter, reaching the apical one-fourth of the mesosternum.

Aradus testaceus Kormilev, NEW SPECIES

Fig. 7

Male.—Elongate ovate; basolateral borders of hemelytra only slightly expanded, slightly wider than pronotum (50:47).

Head: Longer than its width across eyes (27:23.5); anterior process with parallel sides, rounded anteriorly, reaching $\frac{1}{2}$ of antennal segment II; antenniferous tubercles acute, without lateral tooth, reaching $\frac{3}{4}$ of antennal segment I. Eyes subglobose, but not pedunculated; preocular teeth small, but distinct; postocular teeth also small. Vertex very finely granulate. Antennae thin, longer than head (34.5:27); antennal segment I cylindrical, rounded at base; II subcylindrical, slightly enlarged apically, III subcylindrical, tapering toward base; IV fusiform; relative length of antennal segments I to IV are: 4:14.5:8:8. Labium reaching front border of fore coxae.

Pronotum: Shorter than its maximum width (20:47); collar raised and granulate; lateral borders denticulate, almost straight anteriorly, then evenly rounded; hind border sinuate. All carinae parallel on hind disc, inner and

middle carinae converging on fore disc; the latter strongly raised; interlobal depression deep; hind disc raising backward.

Scutellum: Triangular, longer than its basal width (25:21); disc depressed at base, then transversely raised, depressed again on apical $\frac{3}{5}$; lateral borders raised.

Hemelytra: Reaching apex of genital lobes; corium produced beyond front border of connexivum VI; its basolateral border moderately expanded; some veins granulate.

Abdomen: Ovate, slightly narrower than pronotum (46:47); lateral borders rounded; posteroexterior angles of connexiva barely protruding. Sternum VI $\frac{2}{3}$ as long as sternum VII medially. Genital lobes evenly rounded posteriorly, contiguous.

Color: Testaceous, partially pale yellow; antennal segment I and tips of II and III whitish; IV infusate. Pronotum paler at expanded borders and between carinae; lateral borders of scutellum white at middle; basolateral expansions of corium yellow; membrane white mottled with brown; femora whitish at base and on lower side; tibiae yellow apically.

Measurements: Total length 5.30 mm; width of pronotum 1.88 mm; width of abdomen 1.84 mm.

Type.—Holotype, ♂, Mexico, D.F., 15 mi S of Guarda; 14.XI.1946; E. S. Ross leg. Deposited at UCB-AES.

Remarks.—*A. testaceus* runs in Parshley's (1921) key to *A. persimilis* Van Duzee, but differs by the following: Smaller size; lateral teeth absent; antennae shorter than head and pronotum together (34.5:47); and antennal segment II as long as distance between eyes.

Aradus brevicornis Kormilev, NEW SPECIES

Fig. 8

Male.—Elongate ovate; antennae very short, only 1.17× as long as width of head across eyes. Stenopterous.

Head: Slightly shorter than its width across eyes (21:23); anterior process with parallel sides, rounded anteriorly, reaching basal $\frac{1}{3}$ of antennal segment II; antenniferous tubercles short, acute; lateral teeth absent. Eyes globose, subpedunculate; preocular tubercles small and blunt; postocular tubercles absent. Vertex 2 (1 + 1) deeply depressed, depressions connected posteriorly. Antennae strong; antennal segment I cylindrical, rounded at base; II and III clavate; IV fusiform. Labium reaching $\frac{1}{2}$ of prosternum.

Pronotum: Three × shorter than its maximum width (12:35); front border sinuate, collar obsolete; anterior angles rounded and produced forward; lateral borders straight, then evenly rounded, maximum width of pronotum behind middle; hind border deeply sinuate. Inner carinae distinct, others somewhat obsolete.

Scutellum: Triangular, flat, longer than its basal width (20:15); lateral borders slightly reflexed, apex rounded; disc flat, granulate.

Hemelytra: Reaching front border of genital lobes; corium roundly expanded and reflexed at base, wider than pronotum, reaching beyond front border of connexivum V. Membrane narrow at basal $\frac{2}{3}$, then roundly expanded.

Abdomen: Ovate, longer than its maximum width across segment V (57:50); lateral borders parallel at III, then roundly expanded, becoming arcuate. Posteroexterior angles of connexiva II to V not protruding; VI protruding; VII angularly rounded; genital lobes rounded posteriorly, their inner margins straight and contiguous. Sternum VI $\frac{1}{2}$ as long as VII medially.

Color: Brown; base of head with transverse yellow streak; posterior border of tergum III orange red; labium and legs yellow brown.

Measurements: Total length 4.40 mm; width of pronotum 1.40 mm; width of abdomen 2.00 mm.

Type.—Holotype, ♂, U.S.A., California, Peaceful Valley, 26.VIII; Corkeul leg.: deposited at UCB-AES.

Remarks.—*A. brevicornis* runs in Parshley's key to *A. borealis* Heide-
mann but differs by the following: Much shorter antennae; antennal segment II half as long as distance between eyes; much shorter labium reaching half of prosternum; and different coloration.

Aradus occidentalis Kormilev, NEW SPECIES

Fig. 9

Male.—Elongate, with parallel sides; lateral borders of pronotum very finely granulate.

Head: Longer than its width across eyes (25:23); anterior process with parallel sides, reaching basal $\frac{1}{5}$ of antennal segment II; antenniferous tubercles acute, reaching $\frac{1}{2}$ of antennal segment I; lateral tooth absent; pre-ocular teeth blunt; postocular teeth absent. Eyes globose. Vertex with 2 (1 + 1) deep depressions and with curved white line behind them. Antennae stout, slightly thicker than front femora; antennal segment I cylindrical, rounded at base; II cylindrical, attenuated at base; III slightly depressed; IV fusiform; relative lengths of antennal segments I to IV are: 6:21:11.5:9. Labium slightly produced beyond front border of mesosternum.

Pronotum: Less than $\frac{1}{2}$ as long as its maximum width (20:42); anterior angles not protruding; lateral borders slightly sinuate, then evenly arcuate; hind border sinuate medially. Fore disc with 2 (1 + 1) curved calloused spots; hind disc transversely rugose between carinae; inner and middle carinae parallel between themselves.

Scutellum: Triangular, longer than its basal width (27:17); lateral borders

high, parallel at base, then straight and converging; apex narrowly rounded. Disc raised at base, then depressed and transversely rugose.

Hemelytra: Reaching apex of genital lobes. Corium reaching beyond front border of connexivum VI; all veins raised.

Abdomen: Longer than wide (50:48); lateral borders parallel, then rounded; posteroexterior angles of connexiva not protruding, PE-VII acute. Sternum VI slightly shorter than VII. Genital lobes contiguous, forming round hole in middle.

Color: Black; antennal segment III white, legs brown, membrane black.

Measurements: Total length 4.96 mm; width of pronotum 1.68 mm; width of abdomen 1.92 mm.

Type.—Holotype, ♂, U.S.A., Washington, Puyallup, 17.V.1934; Wm. W. Baker leg.; deposited at UCB-AES.

Remarks.—*Aradus occidentalis* is related to *A. penningtoni* Drake from South America and is similar to it, but it may be separated by: Antennal segment II cylindrical (depressed in *A. penningtoni*); and antennae relatively longer, 2× as long as width of head across eyes (1.55× in *A. penningtoni*).

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